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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/904,624	07/16/2001	Amir I. Zaghloul	A7791	2986

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EXAMINER	
D AGOSTA, STEPHEN M	

ART UNIT	PAPER NUMBER
2683	

DATE MAILED: 07/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/904,624	ZAGHLOUL ET AL.	
	Examiner	Art Unit	
	Stephen M. D'Agosta	2683	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,7 and 13-20* is/are rejected.

7)☒ Claim(s) *5, 8-12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 July 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

It does not identify the citizenship of each inventor. The citizenship for Amir Zaghloul is not listed.

Priority

The application's claim to a provisional application is accepted (note the 7-16-01 date is greater than one year after the provisional filing date but the 7-14-01 date fell on a Saturday).

Specification

The abstract of the disclosure is objected to because it uses the term "invention" which should be removed – 1) the application has not been patented yet, 2) the abstract should only disclose an overview of the system/method (remove the first three words to correct) . Correction is required. See MPEP § 608.01(b).

Drawings

1. The drawings filed on 7-16-01 are acceptable subject to correction of the informalities indicated on the attached "Notice of Draftsperson's Patent Drawing Review," PTO-948. In order to avoid abandonment of this application, correction is required in reply to the Office action. The correction will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: #1 is not shown in Figure 1. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The Figure 1 drawing is objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "2, 4 and 6" has been used to designate both two sets of Amplifiers, radiating elements and DBF's (propose labeling them as

2a/2b, 4a/4b and 6a/6b). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

4. Figure 5 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

- There is no description of Figure 5 in the specification.
- There are no reference numbers on the figure.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 7, 13 and 16 rejected under 35 U.S.C. 102(e) as being anticipated by Monte et al. US 6,101,385 (hereafter Monte).

As per **claim 1**, Monte teaches a method of communicating via satellite in a system comprising a satellite having a first type antenna capable of transmission of communication signals to a region on the earth's surface and a plurality of earth stations disposed in said region, each earth station having a second type of antenna capable of reception of said signals (Title, Abstract and figure 3 shows satellite #20 communicating with both earth stations #23 and mobile users #30 and C2, L66 to C4, L17), said method comprising:

Transmitting from said first antenna multiple sub-beams within bandwidth allocated to a basic spot beam to said plurality of antennas in said region (C1, L31-45 teaches re-use of allocated bandwidth, via spatial diversity, that divides the service region into sub-regions and employs separate smaller sub-beams to serve each sub-region. Also see figures 1-2 which discloses a spot beam divided into smaller sub-beams and is described in C1, L46-62 and C2, L3-20).

As per **claim 2**, Monte teaches claim 1 wherein the sub-beams are transmitted within the frequency range of said basic spot beam (C1, L31-45 and C2, L3-20 teaches one beam which is divided into sub-beams to re-use said one beam's allocated bandwidth which inherently would use it's same frequency range. Also figure 3 shows the earth station uplink being 5091-5250Mhz and downlink being 6875-7055Mhz which constrains the frequency range for one or more signals being transmitted from earth station to satellite).

As per **claim 3**, Monte teaches claim 1 wherein said sub-beams are transmitted in a plurality to form a cluster wherein said cluster has same coverage area in said region as said basic spot beams (abstract, figures 1 and 2 show a spot beam being divided into a cluster arrangement which serves the region as that of the spot beam, C1, L22-62).

As per **claim 4**, Monte teaches claim 1 wherein said sub-beams are transmitted by use of a phased array antenna (C1, L60-62).

As per **claim 7**, Monte teaches claim 3 wherein said clusters are transmitted so as to form a coverage area, said coverage area is a contiguous area defined by a matrix, where each facet of said matrix has interlocking borders, said borders defined as the contours of said spot beam (figures 1-2 show a spot beam that is divided into a coverage area cluster defined by a matrix [eg. is numbered] with interlocking borders that cover the contours of the full spot beam. The examiner notes the comparison of this claim and the applicant's figure 2a showing a spot covered by concentric circles to Monte's figures 1-2 which provide similar coverage and hence read on the claim).

As per **claim 13**, Monte teaches claim 4 wherein said transmission originates from a low or medium earth orbiting system (figure 3, LEO satellite #20, C4,L1-5).

As per **claim 16**, Monte teaches claim 1 wherein said sub-beams number 4 or more (figues 1-2 show more than 4 sub-beams).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 6 rejected under 35 U.S.C. 103(a) as being unpatentable over Monte as applied to claim1 above, and further in view of Dent US 6,377,558 (hereafter Dent).

As per **claim 6**, Monte teaches claim 1 **but is silent on** wherein said sub-beams require less peak gain than said basic spot beam.

Dent teaches that a beam using the whole aperture (eg. a basic spot beam) the beam gain would have 6 dB more times the peak power/gain of a beam not using the entire aperture (eg. a sub-beam) which will therefore have less peak gain (C6, L35-47).

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Monte, such that a sub-beam requires less peak gain than a basic spot beam, to provide means for controlling gain based on using a spot beam or sub-beam as the situation dictates.

Claims 14-15 and 17-19 rejected under 35 U.S.C. 103(a) as being unpatentable over Monte as applied to claim1 above, and further in view of Eguchi US 5,594,460 (hereafter Eguchi).

As per **claim 14**, Monte teaches claim 1 **but is silent on** said basic beam has 3 or more dB of gain drop.

Eguchi teaches an antenna array system (title) whereby a single element/spot beam (figure 5, #20) has a broad 3 dB beam width (eg. gain)[C6, L42-47]. The examiner notes that 3dB beam width is the width of the beam (eg. the spot beam) that will have 3 dB of gain.

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Monte, such that said basic beam has 3 or more dB of gain drop, to provide means for the antenna to have sufficient gain as a basic beam while suppressing losses and phase jumps (per Eguchi, C6, L50-55).

As per **claim 15**, Monte teaches claim 1 **but is silent on** said sub-beam has less than 1 dB of gain drop.

Eguchi teaches an antenna array system (title) whereby a single element (figure 5, #20) has a broad 3 dB beam width and multiple "targets" can be covered by anyone of the beams b0-b5 with a drop in gain of 1 dB or less (C6, L47-50).

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Monte, such that the sub-beam has less than 1dB of gain drop, to provide optimal RF communications link when using sub-beams by only having a 1dB drop in gain or less while suppressing losses and phase jumps (per Eguchi C6, L50-55).

As per **claim 17**, Monte teaches a communication system comprising a satellite having a first type of antenna capable of transmission of communication signals to a region on the earth's surface and a plurality of earth stations disposed in said region, each earth station having a second antenna capable of reception of said signals (Title,

Abstract and figure 3 shows satellite #20 communicating with both earth stations #23 and mobile users #30 and C2, L66 to C4, L17);

A phased array antenna (C1, L60-62);

A digital beam former that produces multiple sub-beams within the parameters of a basic spot beam (C10, L21-31 teaches phased array and L58-64 teaches connection between array elements and beam-former network/hardware, also see figure 4. Sub-beams disclosed in C1, 30-62); and

But is silent on an aperature sized to produce sub-beams with a gain drop of less than 3dB.

Eguchi teaches an antenna array system (title) whereby a single element/spot beam (figure 5, #20) has a broad 3 dB beam width (eg. gain)[C6, L42-47]. The examiner notes that 3dB beam width is the width of the beam (eg. the spot beam) that will have 3 dB of gain. Eguchi also teaches an antenna array system (title) whereby a single element (figure 5, #20) has a broad 3 dB beam width and multiple "targets" can be covered by anyone of the beams b0-b5 with a drop in gain of 1 dB or less (C6, L47-50).

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Monte, such that the sub-beam has less than 1dB of gain drop, to provide optimal RF communications link when using sub-beams by only having a 1dB drop in gain or less while suppressing losses and phase jumps (per Eguchi C6, L50-55).

As per **claim 18**, Monte in view of Eguchi teaches claim 17 and said antenna and digital beam former are installed on a satellite (figure 4 shows antenna and beamformer hardware installed on satellite, C10, L21-64).

As per **claim 19**, Monte in view of Eguchi teaches claim 18 and said satellite is in low or medium earth orbit (C4, L1-7).

Claim 20 rejected under 35 U.S.C. 103(a) as being unpatentable over Monte as applied to claim1 above, and further in view of Norin et al. US 6,434,384 (hereafter Norin).

As per **claim 20**, Monte teaches a satellite antenna (abstract and figure 3, #20) comprising:

A phased array antenna (C1, L60-62);

A digital beam former operatively connected to said phased array antenna and adapted to produce multiple sub-beams (C10, L21-31 teaches phased array and L58-64 teaches connection between array elements and beam-former network/hardware, also see figure 4. Sub-beams disclosed in C1, 30-62),

But is silent on each said sub-beam having a gain that at its peak is approximately equal to an edge gain.

Norin teaches the smaller a beam's peak-to-edge gain differential, the higher will be the signal quality towards the edges of the service area (C6, L50-58). Hence the examiner interprets Norin's "small differential" as reading on the applicant's "approximately equal" language.

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Monte, such that the peak gain is approximately equal to the edge gain, to ensure higher signal quality towards the edges of the service area.

Allowable Subject Matter

Claims 5 and 8-12 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 5: The examiner did not find disclosure of the specific mathematical equation claimed.

Claim 8: The examiner did not find disclosure of each sub-beam defined by a contour level whereby said contour level is determined by a required edge gain.

Claim 9: The examiner did not find disclosure of a gain relationship between spot beams and sub-beams defined by the applicant's mathematical equation.

Claim 10: The examiner did not find disclosure of peak gain being related to half power beam width by as defined by the applicant's mathematical equation.

Claim 11: The examiner did not find disclosure of beamwidth being defined by the applicant's mathematical equation.

Claim 12: The examiner did not find disclosure of contour levels being defined by the applicant's mathematical equation.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

1. Wiedeman US 5,758,260 teaches beam steering
2. Dent US 6,377,558 teaches transmit array
3. Rao et al. US 5,936,588 teaches multiple beam satellite array

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. D'Agosta whose telephone number is 703-306-5426. The examiner can normally be reached on M-F, 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Trost can be reached on 703-308-5318. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SMD